NATURAL ATTENUATION MONITORING REPORT

MELVIN YARBORO PROPERTY (P-342)
2205 OAK HILL DRIVE
GREENSBORO, NORTH CAROLINA

JANUARY 11, 1999

LEGACY ENVIRONMENTAL SERVICES, INC.

NATURAL ATTENUATION MONITORING REPORT

MELVIN YARBORO PROPERTY
2205 OAK HILL DRIVE
GREENSBORO, NORTH CAROLINA

JANUARY 11, 1999

PREPARED BY: LEGACY ENVIRONMENTAL SERVICES, INC.

LEGACY ENVIRONMENTAL SERVICES, INC.

P.O. Box 4560, Greensboro, NC 27404-4560, Phone (336) 316-0452, FAX (336) 299-1961

January 11, 1999

Melvin Yarboro
1072 Tarry Church Road
Star, North Carolina 27356

Reference: Natural Attenuation Monitoring Report
Melvin Yarboro Property
2205 Oak Hill Drive
Greensboro, North Carolina

Dear Mr. Yarboro:

Please find enclosed a report summarizing the natural attenuation monitoring activities conducted at the above referenced facility. Site assessment activities in 1994 and 1995 at this site revealed a release of petroleum in soils and groundwater in the vicinity of a 550 gallon heating oil UST, which was removed from the site on February 24, 1993. Following the soil remediation activities, the three of the remaining five on-site monitor wells were resampled for the purpose of natural attenuation monitoring as specified in the Corrective Action Plan.

If you have questions regarding this report, please contact our office.

Sincerely,

Brandon Moore, L.G.

Henry Nemargut, P.E.
Legacy Environmental Services, Inc.

R98-244

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NATURAL ATTENUATION MONITORING REPORT

MELVIN YARBORO PROPERTY
2205 OAK HILL DRIVE
GREENSBORO, NORTH CAROLINA

1.0 Introduction and Background

1.1 Introduction

Melvin Yarboro owns a property containing one occupied structure used for residence located at 2205 Oak Hill Drive in Greensboro (Guilford County), North Carolina. Figure 1 illustrates the location of this facility on the U.S.G.S. Topographic Map of the Greensboro Quadrangle. This site previously contained one 550 gallon heating oil UST used for heating of the residence. The site layout and former tank location are illustrated in Figure 2. In February of 1993, soil contamination was discovered below the heating oil tank during UST Closure sampling. This contamination showed TPH levels of 1,450 parts per million (ppm) by EPA Method 3550 and 145 ppm by Method 5030.

Following discovery of the release, Melvin Yarboro contracted Legacy Environmental Services (Legacy) to perform comprehensive site assessment activities at the site. Legacy's Comprehensive Site Assessment (CSA) report was submitted on March 10, 1995. Following completion of the CSA, Legacy prepared a Corrective Action Plan (CAP) which determined excavation and off-site disposal to be the most efficient method of soil remediation. Legacy's CAP for this site was submitted on April 4, 1997. The heating oil UST was removed from the site on February 24, 1993, and Legacy's UST Closure report was submitted on March 24, 1993. Refer to Legacy's Site Remediation report dated August 29, 1997 for further information regarding the soil remediation activities. Following the remediation of contaminated soils at the project site, the CAP specified sampling of the on-site monitor wells quarterly for the first year. These activities have been conducted to verify that residual petroleum constituents in the groundwater are not migrating towards adjacent properties.

1.2 Scope of Services

This natural attenuation monitoring report contains documentation concerning the following activities which have been conducted at this facility:

- A monitor well sampling event conducted on MW-3, MW-4, and MW-5 by Legacy on November 25, 1998, and resampling of MW-4 on December 14, 1998.
- Laboratory analyses of groundwater samples conducted by Froehling and Robertson, Inc. of Richmond, VA.
- The approximate groundwater flow direction and hydraulic gradient at the site calculated by Legacy.
- Isoconcentration maps illustrating the current contaminant levels in the monitoring wells at the facility prepared by Legacy.

2.0 Field Activities

2.1 Ground Water Flow Direction and Gradient

In order to estimate the groundwater flow direction in the vicinity of the petroleum release, elevations of the monitor well casings were measured using surveying equipment. Static water levels were obtained from each of the wells and the data was used to compute a potentiometric surface map which is included as Figure 3.

Groundwater data and monitoring well information, which are summarized in Table 1, were also used to estimate the hydraulic gradient at the project site. Using the horizontal distance between the monitor wells and the static water levels, the groundwater was estimated to be flowing in a east to southeast direction with a hydraulic gradient of approximately 0.0524 ft/ft.

2.2 Monitor Well Sampling and Analyses

On November 25, 1998 monitor wells MW-3, MW-4, and MW-5 were sampled for analyses utilizing EPA Methods 602 + Xylenes and 625 + 10 largest Tentatively Identified Compounds (TICs). Monitor well MW-4 was resampled for 602 + Xylenes on December 14, 1998. Before sampling, the monitor wells were purged by removing a minimum of three well volumes to ensure that the samples were representative of the actual groundwater conditions. The wells were developed using disposable plastic balers suspended with unused nylon string. Following development of the groundwater monitoring wells, samples were obtained from the disposable balers.

All samples were placed in laboratory supplied glassware, labeled with sample location, analysis to be performed, time, date and sampler's name. The sample jars were then immediately placed in a cooler, chilled with ice to approximately 4^{o}C in preparation of transportation to an analytical laboratory utilizing EPA approved chain-of-custody procedures.

Following receipt of the laboratory analytical results for the November 25, 1998 event, monitor well MW-4 showed Benzene at a concentration of 1.8 ppb. No other target petroleum constituents were reported above laboratory detection limits in any of the three monitoring wells which were sampled during this investigation. Several TICs were also detected in each of the samples; however, no 2L Standard has been established for TICs. The Benzene results for this sampling event showed contaminants in a perimeter down-gradient well (MW-4), but not in the well immediately down-gradient of the source area (MW-5). This data would seem to suggest either cross-contamination or insufficient decontamination of equipment by the analytical laboratory. Therefore, monitor well MW-4 was resampled for 602 + Xylenes on December 14, 1998 due to suspected laboratory error. The sample results for the resampling event failed to indicate detectable concentrations of any compounds in MW-4. Table 2 summarizes the laboratory analytical results for the groundwater samples, and Appendix A contains copies of the analytical reports.

2.3 Plume Development

In the original sampling event conducted in 1995, Benzene and Naphthalene were reported above 2L Standards in MW-1. However, no compounds were reported above laboratory detection limits at the site following soil remediation activities. The soil excavation activities coupled with natural processes appear to have remediated the groundwater in the vicinity of the release source. Table 3 contains the time based analytical results for Total BTEX, and Figure 6 illustrates the same information graphically. The figure and graph referenced above indicate that the contaminant plume at this site has decreased following remedial activities.

3.0 Conclusions and Recommendations

3.1 General Summary

A natural attenuation monitoring event conducted at the Yarboro property located at 2205 Oak Hill Drive in Greensboro, NC has been completed. From a review of all information gathered during this remediation project, Legacy Environmental Services, Inc. makes the following conclusions:

- No petroleum constituents were detected above current listed 2L Standards in the groundwater samples at the project site.
- The contaminants in the groundwater at 2205 Oak Hill Drive are not migrating towards the down-gradient property. Natural attenuation appears to have effectively remediated the groundwater at the site.

3.2 Recommendations

Legacy recommends no further assessment or remedial actions at the 2205 Oak Hill Drive. The monitor wells at this facility should be abandoned and the site closed. A copy of this monitoring report should be forwarded to the following address:

Guilford County Health Department
1100 E. Wendover Avenue
Greensboro, North Carolina 27405

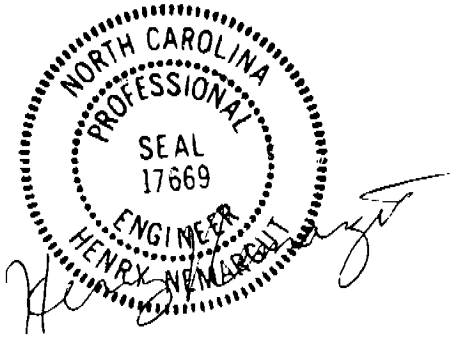
3.3 Limitations

This report has been prepared for the exclusive use of Melvin Yarboro for the specific application to the referenced site located in Guilford County, North Carolina. The assessment was conducted based on the scope of work and level of effort desired by the client. Our findings have been developed in accordance with generally accepted standards in the practice of Natural Attenuation Monitoring in the State of North Carolina, available information and our professional judgement. No other warranty is expressed or implied.

The data presented in this report are indicative of conditions that existed at the precise locations sampled and at the time the samples were collected. Additionally, the data obtained from the samples would be interpreted as meaningful with respect to the parameters indicated in the laboratory reports. No additional information can be logically inferred form this data.

4.0 Professional Certification

The Natural Attenuation Monitoring Report for this site has been prepared by Legacy Environmental Services, Inc. under the direct supervision of licensed engineers or geologists. Technical review of this document has been provided by Henry Nemargut Engineering Services. All engineering work performed on this project was conducted under my direct supervision:



Henry Nemargut, P.E.
Henry Nemargut Engineering Services
North Carolina License #17669

FIGURES

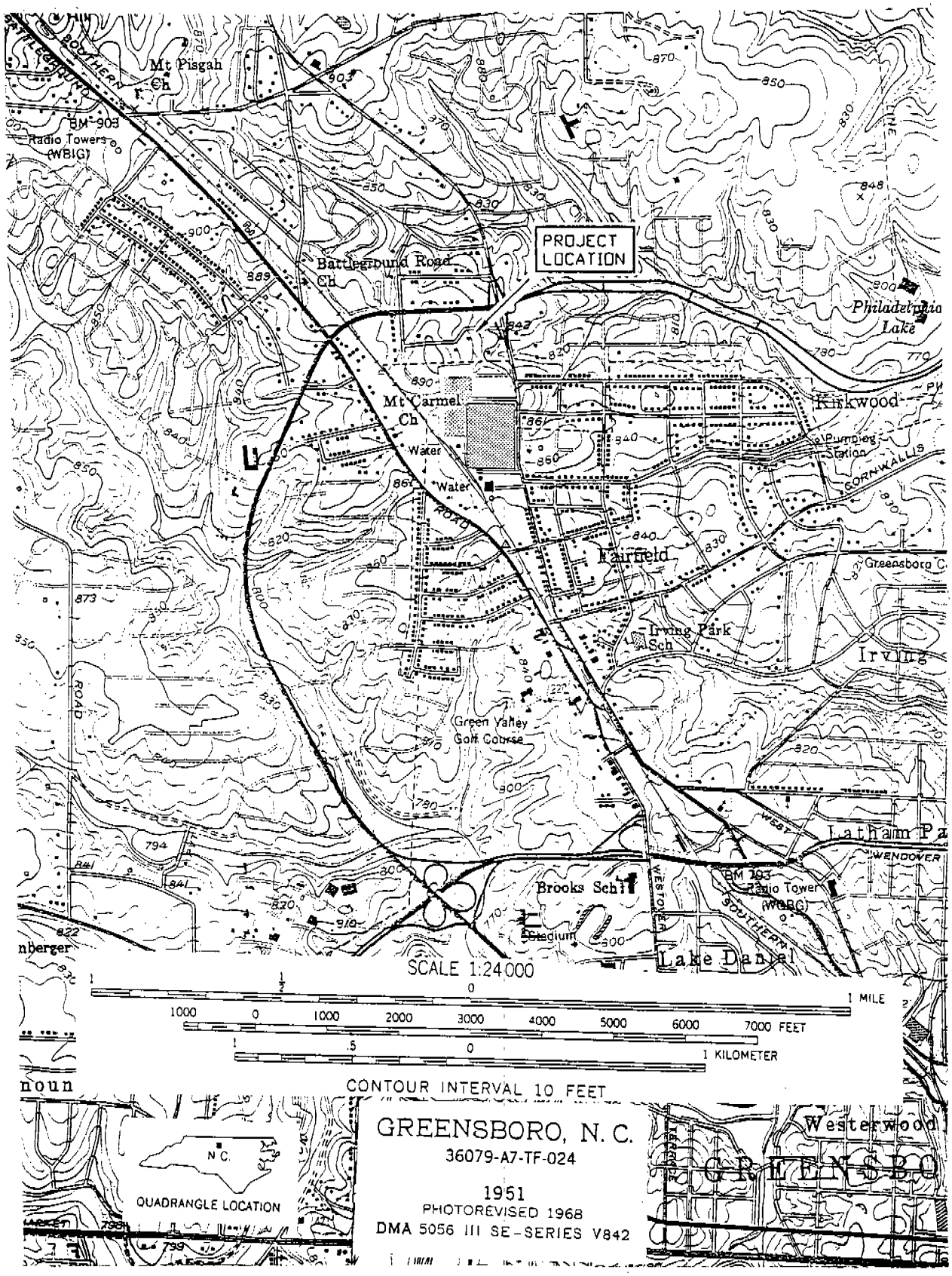


FIGURE 1

LEGACY ENVIRONMENTAL SERVICES, INC.
GREENSBORO, NORTH CAROLINA

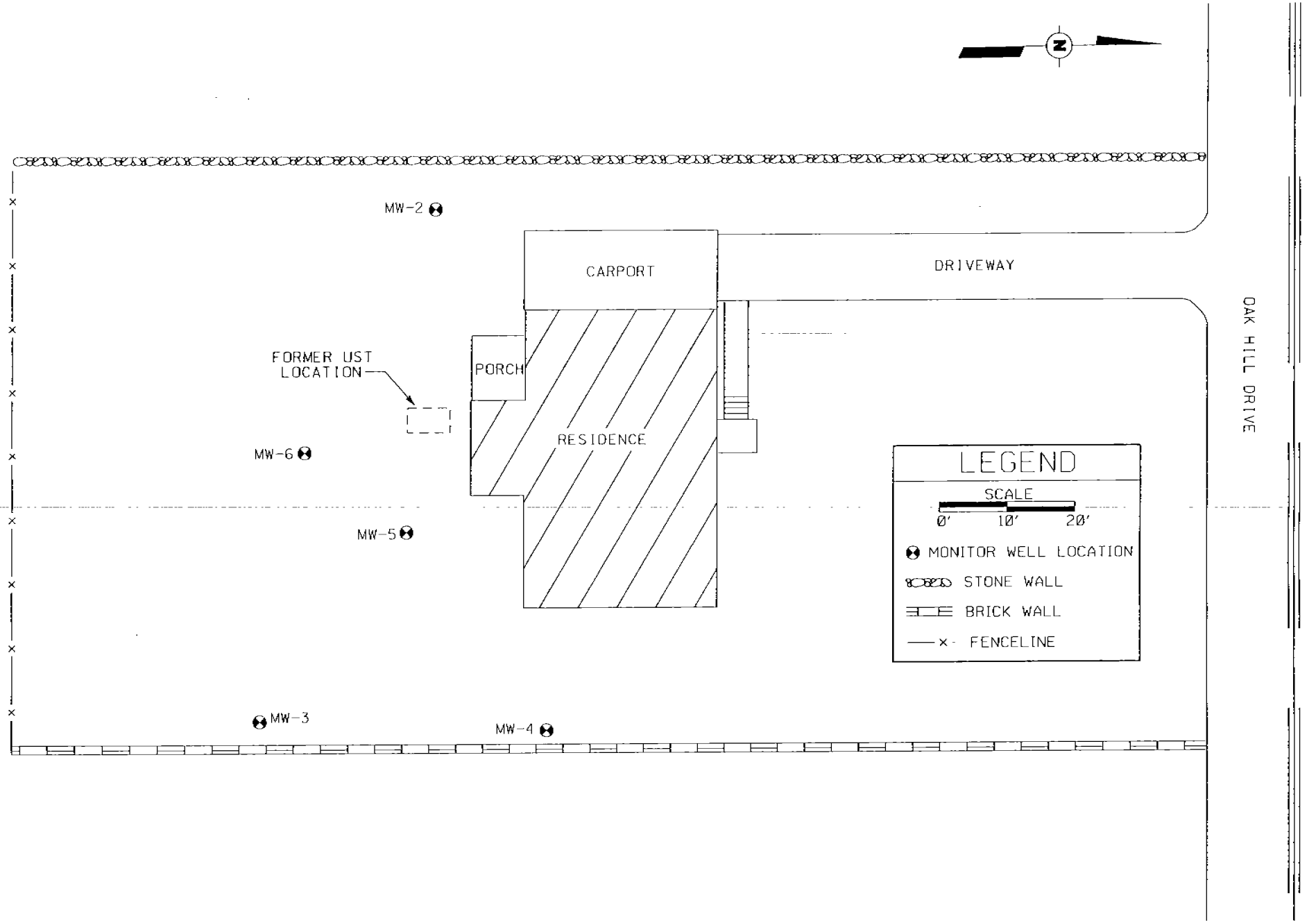
CLIENT: MELVIN YARBOROUGH GREENSBORO, NC

PROJECT: NATURAL ATTENUATION MONITORING 2205 OAK HILL DRIVE GREENSBORO, N.C.

TITLE: PROJECT LOCATION U.S.G.S. TOPO MAP GREENSBORO QUADRANGLE

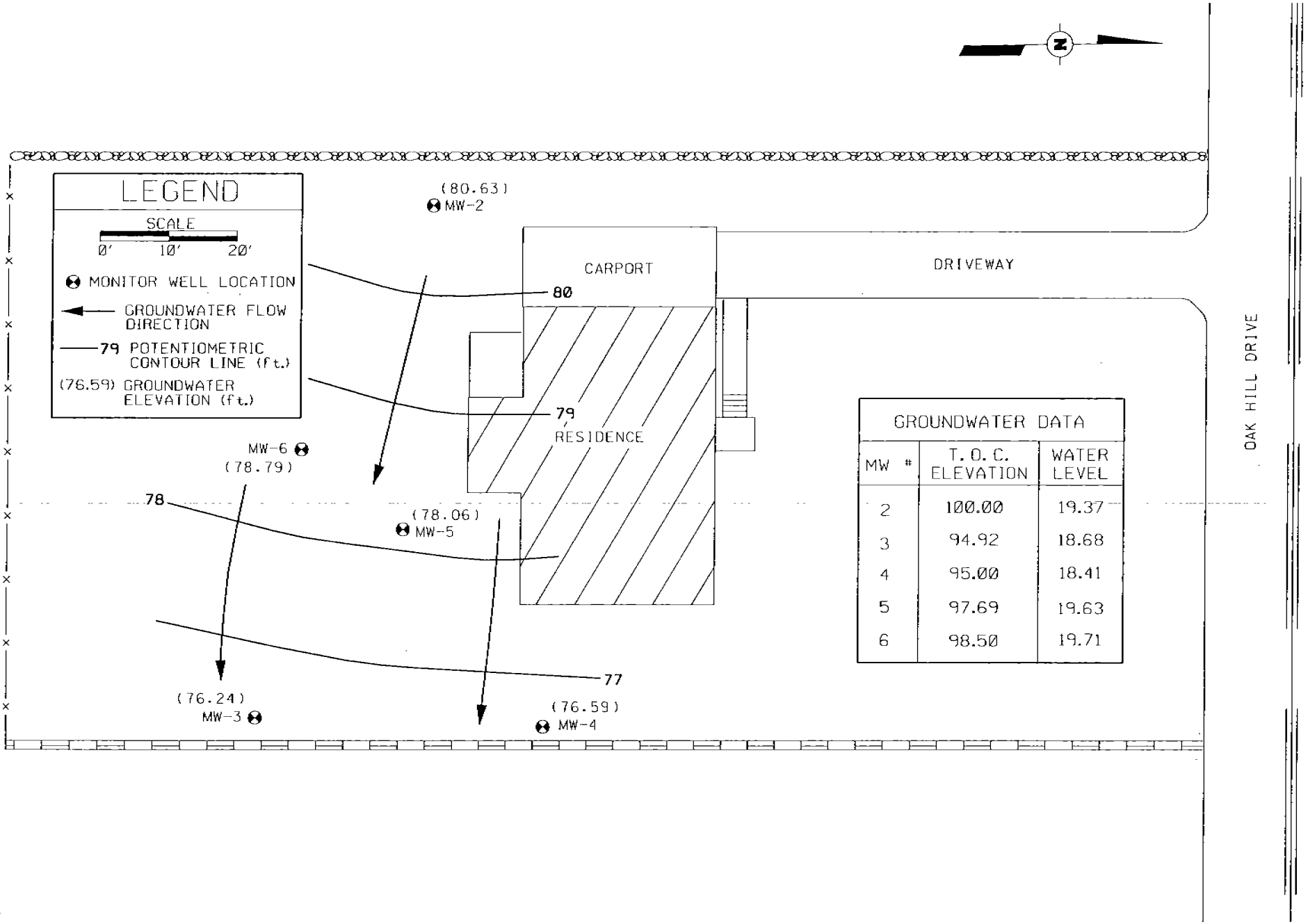
SCALE:	1"=2000'
DATE:	7/24/98
DWN.BY:	KBM
DWG.#	L98-1532

FIGURE 2



SCALE: 1"=20'	TITLE: SITE LAYOUT AND MONITOR WELL LOCATIONS	PROJECT: NATURAL ATTENUATION MONITORING 2205 OAK HILL DRIVE GREENSBORO, N.C.	CLIENT: MELVIN YARBOROUGH GREENSBORO, NC	LEGACY ENVIRONMENTAL SERVICES, INC. GREENSBORO, NORTH CAROLINA
DATE: 1/7/99				
DWN.BY: KBM				
DWG.# 1.98-153				

FIGURE 3



GROUNDWATER DATA		
MW #	T. O. C. ELEVATION	WATER LEVEL
2	100.00	19.37
3	94.92	18.68
4	95.00	18.41
5	97.69	19.63
6	98.50	19.71

SCALE:	1"=20'
DATE:	1/7/99
DWN.BY:	KBM
DWG.#	L98-153B

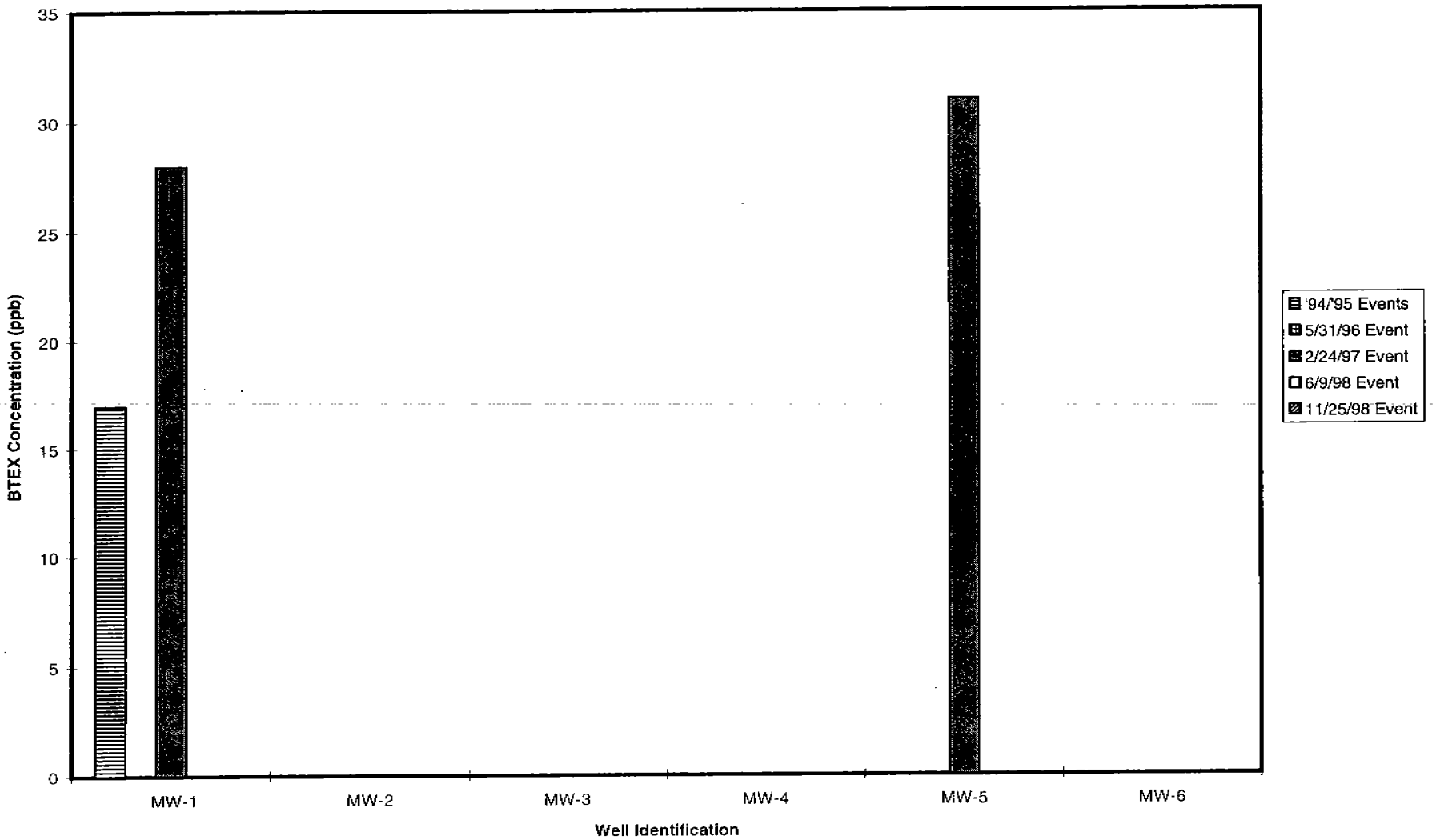
TITLE: POTENTIOMETRIC SURFACE MAP (AS MEASURED ON 11/25/98)

PROJECT: NATURAL ATTENUATION MONITORING 2205 OAK HILL DRIVE GREENSBORO, N.C.

CLIENT: MELVIN YARBOROUGH GREENSBORO, NC

LEGACY ENVIRONMENTAL SERVICES, INC.
GREENSBORO, NORTH CAROLINA

FIGURE 4: Total BTEX Concentration vs. TIme



TABLES

TABLE 1

Monitoring Well Information and Groundwater Elevations

2205 Oak Hill Drive
Guilford County, Greensboro, North Carolina

Well Number	Top of Casing Elevation	Top of Screen Elevation	Bottom of Screen Elevation	Depth to Water	Groundwater Elevation
MW-2	100.00	86.00	66.00	19.37	80.63
MW-3	94.92	80.92	60.92	18.68	76.24
MW-4	95.00	71.00	61.00	18.41	76.59
MW-5	97.69	80.69	60.69	19.63	78.06
MW-6	98.50	88.50	73.50	19.71	78.79

All measurements taken in feet on 11/25/98 and based on an arbitrary benchmark of 100.00 feet at MW-2.

X98-160D

TABLE 2

Summary of Groundwater Laboratory Analytical Results

2205 Oak Hill Drive

Greensboro, Guilford County, North Carolina

CONSTITUENT	MW-3	MW-4	MW-5	2L Standard
Date	*11/25/98*	*12/14/98*	*11/25/98*	
Benzene	BDL	BDL	BDL	1
Toluene	BDL	BDL	BDL	1,000
Ethylbenzene	BDL	BDL	BDL	29
Xylenes (total)	BDL	BDL	BDL	530
BTEX (total)	BDL	BDL	BDL	NSE
1,2 Dichlorobenzene	BDL	BDL	BDL	NSE
1,3 Dichlorobenzene	BDL	BDL	BDL	NSE
1,4 Dichlorobenzene	BDL	BDL	BDL	NSE
Date	*11/25/98*	*11/25/98*	*11/25/98*	
Flourene	BDL	BDL	BDL	21
Naphthalene	BDL	BDL	BDL	NSE
Phenanthrene	BDL	BDL	BDL	NSE
TICs (total)	BDL	BDL	BDL	NSE

All results reported in micrograms per liter (ug/l)

BDL = Below Detection Limits

TICs = Total Tentatively Identified Compounds

NSE = No Standard Established

X98-160C

TABLE 3

Time Based Laboratory Analytical Results - Total BTEX

2205 Oak Hill Drive
Greensboro, North Carolina

	Total BTEX Concentration					
Date of Sampling	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
3/18/94-2/1/95	17	BDL	BDL	BDL	BDL	N/A
5/31/96	BDL	BDL	BDL	BDL	BDL	BDL
2/24/97	28	BDL	BDL	BDL	31	BDL
6/9/98	N/A	N/A	BDL	BDL	BDL	N/A
11/25/98	N/A	N/A	BDL	BDL	BDL	N/A

All results reported in micrograms per liter (ug/l)

TICs = Tentatively Identified Compounds

N/A = Data not available for this sampling event

X98-160E

APPENDIX A

GROUNDWATER LABORATORY ANALYTICAL RESULTS

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CERTIFICATE OF ANALYSIS

December 11, 1998

LAB #:	9812010
CLIENT:	Legacy Environmental Services, Inc. P.O. Box 4560 Greensboro, NC 27404-4560 Attn: Henry Nemargut
PROJECT#:	P-342T
PROJECT:	2205 Oak Hill Dr.
SAMPLED BY:	T. Rigley
LAB RECEIPT:	12/02/98, 0823

PARAMETER	ANALYSIS DATE/TIME	METHOD	ANALYST
Purgeable Aromatics	12/07/98, 1339	EPA 602	DB
Semivolatile Organic Compounds-BN	12/03/98, 1813	EPA 625	BD
Semivolatile Extraction	12/02/98, 0840	EPA 625-BN	BD/DG

Results appear on the following pages.

Audrey N. Brubeck
Laboratory Manager

ANB/psg

RESULTS:

F&R #:	9812010-01	9812010-02	9812010-03	
SAMPLE ID:	MW-3	MW-4	MW-5	
DATE/TIME:	11/25/98, 1000	11/25/98, 1025	11/25/98, 1045	
MATRIX:	Water/grab	Water/grab	Water/grab	
				Reporting Limit:
Semivolatile Organic Compounds (µg/L)				
Acenaphthene	BDL	BDL	BDL	5.0
Acenaphthylene	BDL	BDL	BDL	5.0
Anthracene	BDL	BDL	BDL	5.0
Benzidine	BDL	BDL	BDL	5.0
Benzo[a]anthracene	BDL	BDL	BDL	5.0
Benzo[a]pyrene	BDL	BDL	BDL	5.0
Benzo[b]fluoranthene	BDL	BDL	BDL	5.0
Benzo[g,h,i]perylene	BDL	BDL	BDL	5.0
Benzo[k]fluoranthene	BDL	BDL	BDL	5.0
bis(2-Chloroethoxyl)methane	BDL	BDL	BDL	5.0
bis(2-Chloroethyl)ether	BDL	BDL	BDL	5.0
bis(2-Chloroisopropyl)ether	BDL	BDL	BDL	5.0
bis(2-Ethylhexyl)phthalate	BDL	BDL	BDL	5.0
4-Bromophenyl-phenylether	BDL	BDL	BDL	5.0
Butylbenzylphthalate	BDL	BDL	BDL	5.0
2-Chloronaphthalene	BDL	BDL	BDL	5.0
4-Chlorophenyl-phenylether	BDL	BDL	BDL	5.0
Chrysene	BDL	BDL	BDL	5.0
Dibenz[a,h]anthracene	BDL	BDL	BDL	5.0
1,2-Dichlorobenzene	BDL	BDL	BDL	5.0
1,3-Dichlorobenzene	BDL	BDL	BDL	5.0
1,4-Dichlorobenzene	BDL	BDL	BDL	5.0
3,3'-Dichlorobenzidine	BDL	BDL	BDL	5.0
Diethylphthalate	BDL	BDL	BDL	5.0
Dimethylphthalate	BDL	BDL	BDL	5.0
Di-n-butylphthalate	BDL	BDL	BDL	5.0
2,4-Dinitrotoluene	BDL	BDL	BDL	5.0
2,6-Dinitrotoluene	BDL	BDL	BDL	5.0
Di-n-octylphthalate	BDL	BDL	BDL	5.0
Fluoranthene	BDL	BDL	BDL	5.0
Fluorene	BDL	BDL	BDL	5.0
Hexachlorobenzene	BDL	BDL	BDL	5.0
Hexachlorobutadiene	BDL	BDL	BDL	5.0
Hexachlorocyclopentadiene	BDL	BDL	BDL	5.0
Hexachloroethane	BDL	BDL	BDL	5.0
Indeno[1,2,3-cd]pyrene	BDL	BDL	BDL	5.0
Isophorone	BDL	BDL	BDL	5.0
Naphthalene	BDL	BDL	BDL	5.0

µg/L = microgram per Liter **BDL** = Below Detection Limit

RESULTS:

F&R #:	9812010-01	9812010-02	9812010-03	
SAMPLE ID:	MW-3	MW-4	MW-5	
DATE/TIME:	11/25/98, 1000	11/25/98, 1025	11/25/98, 1045	
MATRIX:	Water/grab	Water/grab	Water/grab	
				Reporting Limit:
Semivolatile Organic Compounds (µg/L)				
Nitrobenzene	BDL	BDL	BDL	5.0
n-Nitroso-di-n-propylamine	BDL	BDL	BDL	5.0
n-Nitrosodiphenylamine	BDL	BDL	BDL	5.0
Phenanthrene	BDL	BDL	BDL	5.0
Pyrene	BDL	BDL	BDL	5.0
1,2,4-Trichlorobenzene	BDL	BDL	BDL	5.0
Purgeable Aromatics (µg/L)				
Toluene	BDL	BDL	BDL	1.0
Benzene	BDL	1.8	BDL	1.0
Total Xylenes	BDL	BDL	BDL	3.0
Chlorobenzene	BDL	BDL	BDL	1.0
1,2-Dichlorobenzene	BDL	BDL	BDL	5.0
1,3-Dichlorobenzene	BDL	BDL	BDL	5.0
1,4-Dichlorobenzene	BDL	BDL	BDL	5.0
Ethylbenzene	BDL	BDL	BDL	1.0

µg/L = microgram per Liter **BDL** = Below Detection Limit

Library Search
Tentatively Identified Compounds

	Retention Time	Estimated Conc. (µg/L)	% Match
9812010-01			
Compound			
*Butoxyethoxy-ethanol	9.89	8.05	90
bis-dimethylethyl-phenol	14.28	42.0	97
*Present in blank at 21.1 µg/L.			
9812010-02			
Compound			
*Methoxyethoxy-ethanol	5.85	20.0	83
**Butoxyethoxy-ethanol	9.89	5.64	93
bis-dimethylethyl-phenol	14.28	7.60	97
***Methoxyethoxy-ethanol	5.85	16.0	83
Pinene alpha	5.91	5.37	96
*Present in blank at 54.4 µg/L.			
**Present in blank at 21.1 µg/L.			
***Present in blank at 54.4 µg/L.			
9812010-03			
Compound			
*Butoxyethoxy-ethanol	9.89	7.11	90
Eicosane	27.30	44.0	91
Dotriacontane	28.20	4.43	91
*Present in blank at 21.1 µg/L.			

LEGACY ENVIRONMENTAL SERVICES, INC.

P.O. Box 4560, Greensboro, NC 27404-4560, Phone (336) 316-0452, FAX (336) 299-1961

9812010

CHAIN OF CUSTODY RECORD

Facility: 2205 Oak Hill Drive

LES Job #: P-342 T

Samplers signature: [signature] Printed name: Tom Risley

Sample Number	Sample Location	Date	Time	Sample Type Water Comp	Water Grab	Soil	No. of Contents	Analysis Required
-01 MW-3	Monitor Well #3	11-25-98	10:00 am		X		4	602 + xylenes, 625 B/N + 10 peaks
-02 MW-4	" " #4	"	10:25 am		X		4	" "
-03 MW-5	" " #5	"	10:45 am		X		4	" "

Note: Unless otherwise noted, the regulatory agency is the NCDENR for these samples.
Any subcontracted laboratory services must be preaproved.
Our written purchase order accompanied by this record is your notice to proceed.

Relinquised by: (Signature)	Received by: (Signature)	Date / Time
[signature]	[signature]	11/25/98 4:05PM
Relinquised by: (Signature)	Received by: (Signature)	Date / Time
[signature]	[signature]	12/2/98, 0823
Relinquised by: (Signature)	Received by: (Signature)	Date / Time
Methods of shipment:	Received for laboratory by: (Signature)	Date / Time
Conditions upon receipt:	Remarks:	

Revised 5/21/98 LES File: C.O.C.

10°C

SINCE
1881

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GEOTECHNICAL • ENVIRONMENTAL • MATERIALS
ENGINEERS • LABORATORIES
"OVER ONE HUNDRED YEARS OF SERVICE"

CERTIFICATE OF ANALYSIS

December 22, 1998

LAB #:	9812117
CLIENT:	Legacy Environmental Services, Inc. P.O. Box 4560 Greensboro, NC 27404-4560 Attn: Henry Nemargut
PROJECT#:	P-342 U
PROJECT:	Yarboro Property
SAMPLED BY:	C. Simons
LAB RECEIPT:	12/16/98, 1030

PARAMETER	ANALYSIS DATE/TIME	METHOD	ANALYST
Purgeable Aromatics	12/17/98, 1244	EPA 624	VFL

Results appear on the following page.

Audrey N. Brubeck
Laboratory Manager

ANB/psg

RESULTS:

F&R #:	9812117-01	9812117-02	
SAMPLE ID:	MW-4	Trip Blank	
DATE/TIME:	12/14/98, 1435		
MATRIX:	Water/grab	Water/grab	
			Reporting Limit:
Purgeable Aromatics (µg/L)			
Benzene	BDL	BDL	1.0
Chlorobenzene	BDL	BDL	1.0
1,3-Dichlorobenzene	BDL	BDL	1.0
1,4-Dichlorobenzene	BDL	BDL	1.0
1,2-Dichlorobenzene	BDL	BDL	1.0
Ethylbenzene	BDL	BDL	1.0
Toluene	BDL	BDL	1.0
Total Xylenes	BDL	BDL	3.0

µg/L = microgram per Liter

BDL = Below Detection Limit

LEGACY ENVIRONMENTAL SERVICES, INC.

P.O. Box 4560, Greensboro, NC 27404-4560, Phone (336) 316-0452, FAX (336) 299-1961

9812117

CHAIN OF CUSTODY RECORD

Facility: Varbaro Property

LES Job #: P-342 U

Samplers signature: Christine Simons Printed name: C. Simons

Sample Number	Sample Location	Date	Time	Sample Type Water Comp	Water Grab	Soil	No. of Contents	Analysis Required
-01 MW-4	monitor well #4	12/4/98	2:35pm		X		3	602 + xylenes
-02	trip blank							
	temp. blank							
	12/4/98							

Note: Unless otherwise noted, the regulatory agency is the NCDENR for these samples.
Any subcontracted laboratory services must be preapproved.
Our written purchase order accompanied by this record is your notice to proceed.

Relinquised by: (Signature) Christine Simons	Received by: (Signature)	Date / Time 12/15/98
Relinquised by: (Signature)	Received by: (Signature)	Date / Time 12/16/98, 1030
Relinquised by: (Signature)	Received by: (Signature)	Date / Time
Methods of shipment:	Received for laboratory by: (Signature)	Date / Time
Conditions upon receipt:	Remarks: 10°C	

Revised 5/21/98 LES File: C.O.C.